The John Marshall Law Review

Volume 36 | Issue 2 Article 5

Winter 2003

University Technology Transfer and Economic Development: Proposed Cooperative Economic Development Agreements Under the Bayh-Dole Act, 36 J. Marshall L. Rev. 397 (2003)

Clovia Hamilton

UNIVERSITY TECHNOLOGY TRANSFER AND ECONOMIC DEVELOPMENT: PROPOSED COOPERATIVE ECONOMIC DEVELOPMENT AGREEMENTS UNDER THE BAYH-DOLE ACT

CLOVIA HAMILTON*

I. INTRODUCTION

Technology transfer enables private industry and academia to make practical use of advanced research, development, and technical expertise. Indeed, universities are a rich source of science and technology that can support local government and business development as well as economic growth. Thus, it is essential for research universities to transfer their wisdom to the public for its use and benefit. Today, universities operate in an economic climate that requires both capital and knowledge; takes advantage of government technology initiatives (namely the Bayh-Dole Act);[1] and serves as a catalyst for the creation of a large number of new, incubated companies. In fact, one way to take advantage of the dynamics of the "New Economy" and its ability to increase the quality of living at the local government level is to encourage universities to have a seedbed effect on their local economies.

The Bayh-Dole Act has revolutionized university-industry relations, causing university licensing offices to use start-up companies to commercialize early stage inventions. Hundreds of start-up companies have been formed on the basis of a licensed academic invention, resulting in the commercialization of about

* Clovia Hamilton is an Assistant Professor in Planning at East Carolina University with research interest in technology based economic development. She is the former Director of Intellectual Property at Old Dominion University. Hamilton received her J.D. from John Marshall Law School in Atlanta, Georgia and her LL.M. from the University of Illinois. She also has a B.S. in Civil Engineering from the University of Illinois. Hamilton is a member of the Georgia Bar and is registered to practice before the United States PTO. She is the former principal urban planner for the City of Atlanta, and is a member of the American Institute of Certified Planners. The opinions expressed in this article are solely those of the author.

1. 35 U.S.C. §§ 200-212 (2000).

ten percent of university ideas.[2] In order to increase this trend, there needs to be greater communication and cooperation between more players. Organizations besides the universities and industries must take part in the strategic planning that is necessary to effectively commercialize university inventions so that they foster regional economic development.

"[I]n difficult economic times, political stakeholders in the technology transfer process usually view success in economic impact terms, and often from short-term and parochial perspectives – how many jobs in my state next year?"[3] Although universities increasingly pressure their technology transfer specialists to become stewards of their regions' economic development, most specialists have no experience in strategic economic development planning, or in forming collaborations that foster local government economic development. Furthermore, current regulations do not provide specialists with much guidance on how to facilitate economic development collaborations between their offices and other nonprofit organizations. This Article proposes that Congress amend the Bayh-Dole Act to provide guidance on how universities can enter into newly proposed Cooperative Economic Development Agreements (CEDAs) patterned after the Stevenson-Wydler Act's Cooperative Research and Development Agreements (CRADAs).

II. HISTORICAL CONTEXT

"Today's economy is knowledge and idea-based, driven by the ability of firms to innovate and develop new products and processes."[4] The view that universities can foster economic development through technology transfer dates back to the Morrill Act of 1862.[5] The first Morrill Act of 1862 allocated 30,000 acres of public land in each state, based on the 1860 census, to establish land grant colleges.[6] This established "patronage for American

2. Brent Goldfarb & Magnus Henrekson, *Bottom-Up vs. Top-Down Policies towards the Commercialization of University Intellectual Property*, SSE/EFI Working Paper Series on Economics and Finance No. 463 (2002).

3. Robert Carr, *A Proposal for a Framework for Measuring and Evaluating Technology Transfer from the Federal Laboratories to Industry, in* FROM LAB TO MARKET: COMMERCIALIZATION OF PUBLIC SECTOR TECHNOLOGY 299, 302 (Sulieman K. Kassicieh & H. Raymond Radosevich ed., 1994).

4. STATE SCIENCE & TECHNOLOGY INSTITUTE, ECONOMIC DEVELOPMENT ADMINISTRATION, *Science & Technology Strategic Planning Creating Economic Opportunity*, 3 (1998).

5. *See* 7 U.S.C. § 301 (2000) (providing for lending grant aid to colleges and signed into law by President Lincoln).

6. James Collier, *Scripting the radical critique of science: the Morrill Act and the American Land-Grant University*, 34 Futures 182, 184 (2002).

research in land-grant universities,"[7] and allowed the government to 1) solidify the relationships between "agricultural, economic, military (to a lesser degree) and research interests;" 2) raise revenue to retire federal debts; and 3) "solidify the American economic infrastructure in anticipation of the Civil War's outcome."[8]

From 1865 to 1900, the United States (U.S.) was in the middle of an Industrial Revolution.[9] In the midst of this revolution, Congress passed the Morrill Act of 1890, which increased the endowment and support to colleges for the agriculture and the mechanical arts and extended the land grant provisions to sixteen southern states.[10] Together, the Morrill Acts were a major boost to higher education in America because they led to the establishment of extension services as a means of technology transfer and economic development activities. As a result, the academic attitude shifted from "knowledge as inquiry to knowledge as commodity."[11]

Historically, the acceptable transfer of research results to the public was by way of scientific publication. "In fact, under that ivory tower concept, a researcher who accepted a corporate subsidy aroused the suspicion among his colleagues that he had been diverted from his basic research and had become a tool of vested interests."[12] To accept intellectual property licensing royalties was to accept tainted money. This is known as the Ivory Tower theory and is still prevalent today.

At issue is whether universities will allow commercial forces to determine their educational missions and academic goals. Some commentators are concerned that companies are dictating the terms under which universities conduct sponsored research.[13] While the level of importance in a particular discipline is still an important factor in setting a research agenda, more and more university faculty look to what corporations want researched because corporations that once gave unrestricted money to colleges to cultivate good will, now mainly back projects that have direct commercial payoffs. Further, corporations typically ask for the first rights and possibly exclusive rights to intellectual property

---

7. *Id.* at 183.

8. *Id.* at 183, 187.

9. C. H. MCCLURE AND W.H. YARBROUGH, THE UNITED STATES OF AMERICA 468-71 (Laidlaw Brothers 1945).

10. 7 U.S.C. § 322 (2000).

11. Collier, *supra* note 6, at 182.

12. Howard Bremer, *University Technology Transfer Evolution and Revolution,* THE 50TH ANNIVERSARY OF THE COUNCIL ON GOVERNMENTAL RELATIONS 13 (2000).

13. Eyal Press & Jennifer Washburn, *The Kept University*, ATLANTIC MONTHLY Mar. 1, 2000, at 39.

resulting from research. To this end, universities operate technology-licensing offices to manage their patent portfolios as aggressively as any business would.[14]

For example, the University of Wisconsin began this practice in 1924 when it developed a plan "to make use of patentable inventions generated by faculty members."[15] The university's Dr. Harry Steenbock developed a method for using irradiation to increase the Vitamin D content of food and drugs and convinced the university's alumni to create the Wisconsin Alumni Research Foundation (WARF).[16] The ivory tower purists quickly attacked the plan under the "tainted money theory."[17] Purists feared that such an arrangement would divert scientists from basic research to work only on ideas, which appeared to have commercial potential so that money, rather than a genuine pursuit of knowledge would drive research. However, "the intense financial pressures on many universities resulting from the Great Depression of the 1930s, as well as the ability of institutions such as the University of Wisconsin to reap significant revenues from patent licensing, sparked greater interest on the part of universities in patenting in the 1930s."[18]

In addition to the financial pressures created by the Great Depression, World War II also played a role in increasing the practical use of university inventions. Both during and after the war, the technological demands imposed by more and more sophisticated military requirements, as well as the increasing complexity of support services made it apparent that "there were not sufficient resources within the Government to undertake all the scientific projects necessary to a winning war effort."[19] The need to use the best available technology and know-how created a rapid proliferation of government-sponsored research agreements.[20]

However, a major complication with the government-sponsored research agreements was the proper disposition of the intellectual property rights to the inventions. Until today, government employees did almost all of the government-financed research and development work in federal laboratories.[21] Therefore, the government did not know what to do with

14. *Id.*

15. Bremer, *supra* note 12, at 4.

16. David C. Mowery & Bhaven Sampat, *University Patents and Patent Policy Debates: 1925-1980*, 10 INDUSTRIAL & CORPORATE CHANGE 781 (Oct. 2001).

17. *Id.*

18. *Id.*

19. Bremer, *supra* note 12, at 5.

20. *Id.*

21. *Id.*

inventions resulting from invention by private parties that were the subject of patent applications.[22]

The issue was whether the government should always take the commercial rights to patentable inventions generated under a government sponsored research contract or whether such rights would be better left with the contractor or grant recipient to permit use of the patent system for technology transfer. Yet, because of the exigencies of wartime needs, it was never seriously considered a major problem and remains an issue today. In any event, the technology transfer concept, as we know it today, originated during World War II,[23] although technology transfer for military use did not become prevalent until after the war.

In the 1930s, Dr. Vannevar Bush, a famous inventor, V.P. of MIT, and Dean of the MIT School of Engineering, was elected President of the Carnegie Institution of Washington, D.C.[24] In 1940, Dr. Bush was appointed Chairman of the President's National Defense Research Committee, while retaining his position at the Carnegie Institution.[25] By 1941, he was appointed Director of the new Office of Scientific Research and Development that was established to coordinate weapons research and to advise on scientific research and development.[26] Soon after his appointment, a small, $6,000-funded research team was placed under his direction to embark on the two billion dollar Manhattan Project designed to research and produce an atomic bomb (named after the Manhattan Engineering District of the U.S. Army Corps of Engineers).[27]

In the 1940s, Dr. Bush became President Roosevelt's Science Advisor and was asked for recommendations on applying the lessons learned from World War II to civilian, peacetime activities.[28] Focusing on areas that could be employed for the improvement of the national health, the creation of new enterprises bringing new jobs, and an improved national standard of living, Dr. Vannevar Bush authored the proposal to President Roosevelt entitled: "Science: The Endless Frontier."[29] This report

---

22. *Id.*

23. *Id.*

24. David K. Klaphaak, *Events in the Life of Vannevar Bush* (1996), *available at* http://www.cs.brown.edu/research/graphics/html/info/timeline.html (last visited Feb. 3, 2003).

25. *Id.*

26. *Id.*

27. *Id.*

28. *Id.*

29. Vannevar Bush, *Science-The Endless Frontier: A Report to the President* (1945), *available at* http://www/nsf.gov/od/lpa/nsf50/vbush1945.htm (last visited Jan. 30, 2003).

called for a renewed emphasis on basic scientific research and development to support national security and to fight disease. Having witnessed the importance of university research to the national defense for its role in the successful Manhattan Project, Bush recommended using university research to accomplish this goal. In particular, Bush argued for an increase in support by the federal government for scientific research at universities.

In reality, long before the Vannevar Bush concept, but absent federal support in their research endeavors, universities engaged in technology transfer. The greatest technology transfer efforts involved preparing papers on research results for publication in scientific journals.[30] Void of the relative complexity of an intellectual property licensing program, there were also Morrill Act extension services, continuing education programs, and technical consulting services.

Nevertheless, the Post World War II era experienced the rapid technological strides made under the impetus of a wartime footing and the obvious necessity for continuing technological superiority in defense-oriented efforts.[31] This made it imperative to continue to provide public support for science. However, this support was limited to the military.[32] The role of university research and the advancement of scientific knowledge were expected to solve economic, social, and national security problems faced by the nation.[33] "[A]fter World War II research priorities in U.S. universities had shifted away from short-term problem-solving to more fundamental and long-term issues.[34] [Thus], to businesses that [were] small and not research-intensive, academic research . . . became distant."

In 1950, Congress allocated fifteen million dollars to establish the National Science Foundation (NSF) to support basic scientific research at universities.[35] Although the Bush Report gave the private sector short shrift,[36] it was clear at this time that transferring the inventions created in the nation's university laboratories to the private sector for commercial use was essential to future economic growth and global business competitiveness.

30. *See* Yong S. Lee, *'Technology transfer' and the research university: a search for the boundaries of university – industry collaboration*, 25 RES. POL'Y 843, 849 (1996) ("By definition, much of what the university does (teaching, research, publication, and public service) is transfer activity.").

31. Bremer, *supra* note 12, at 5.

32. *Id.*

33. Collier, *supra* note 6, at 187.

34. Lee, *supra* note 30, at 850.

35. Klaphaak, *supra* note 24.

36. Murray Weidenbaum, *Science: The Endless Frontier a Half-Century Later*, *in* SCIENCE FOR THE TWENTY-FIRST CENTURY. WASHINGTON, D.C., 53, 60 (Claude E. Barfield ed., 1997).

This was evidenced by the fact that "in 1960 the private share of total U.S. [research and development] was about one-third" and in 1997, private sector support of U.S. research and development was almost two-thirds of the total.[37]

At the same time, the Government was spending hundreds of millions of dollars on medical research to find cures for diseases and eventually created National Institute of Health (NIH).[38] However, the Government's increased emphasis on medical research soon led to the same shortage in technical ability and research facilities it experienced during World War II. And because "the Government could not do all the necessary work in its own facilities, qualified private companies, universities and nonprofit organizations were sought out to perform many of the programs through contractual arrangements."[39]

The Cold War and the nuclear arms race also reached its zenith in the early 1960s, increasing the Government's dependence on university research. "In 1963, Jerome Weisner, President Kennedy's Science Advisor, recognized a need for some guidelines to effect a more uniform Government policy toward inventions and patents on a Government-wide basis."[40] Dr. Weisner's study culminated in a statement by President Kennedy establishing Government-wide objectives and criteria for allocating legal rights to inventions between the Government and its contractors, which would best serve the overall public interest while encouraging development and utilization of the inventions.[41]

By the late 1960s, it was also apparent that many university inventions had potential commercial use. In fact, in 1968, the Harbridge House studied government funds and estimated that contractor-held inventions were 10.7 times as likely as government-held inventions to be used by the public.[42] In view of this continually evolving economic climate and the emergence of new products from new fundamental ideas, the necessity for supporting research became more evident. However, support of research was and is not enough. That support must be coupled with a creative, innovative technology transfer capability. Invention without innovation has little economic value.

Today, "in an age when ideas are central to the economy, universities will inevitably play a role in fostering growth."[43] In

---

37. *Id.* at 60.
38. *The NIH Almanac*, *available at* http://www.nih.gov/about/almanac/index.html (last visited Feb. 13, 2003).
39. Bremer, *supra* note 12, at 5.
40. *Id.* at 6.
41. *Id.*
42. *Id.*
43. Press & Washburn, *supra* note 13, at 41.

fact, the term "New Economy" has emerged in recent years as a general description for a surge in technological innovation in different fields and the resulting transformation of communities, institutions, and markets that have adopted and applied these innovations.[44] The "New Economy" defines the broad trends of business globalization and the greater role of international trade, international investment, and the information technology revolution. This growth is best illustrated by the current rate of eleven new companies being created every week in Silicon Valley,[45] the area located on the San Francisco, California peninsula radiating outward from Stanford University.

In the 1950s, Stanford University had problems financing the University's rapid postwar growth.[46] University authorities tried to solve the problem by leasing part of the university land to high tech companies for ninety-nine years.[47] Before, the shock waves of the "New Economy" transformation emanated from the Valley's computer industry beginning in the 1970s, the Stanford Industrial Park was found to create a center of high technology close to a cooperative university.[48]

In the 1970s, the U.S. witnessed its fair share of plant closings and industrial downsizing throughout the country.[49] Across the U.S., heavy manufacturing was steadily declining as overseas competition and foreign, cheap labor forced a number of businesses to shutdown. This left many cities financially devastated, "facing legions of undereducated and unemployed factory workers with little hope of a secure future."[50] In response, the federal Economic Development Administration (EDA), U.S. Department of Agriculture (USDA), U.S. Department of Health and Human Services, and the U.S. Department of Housing and Urban Development (HUD) began to invest in small business incubators to find new uses for old, abandoned factory buildings and to put labor back to work with the hope of building new, small innovative businesses.[51] The EDA found that the re-use of vacant

---

44. Stephen Shepard, *The New Economy: What It Really Means*, BUSINESS WEEK, Nov. 17, 1997, at 38-39.

45. Carolyn E. Tajnai, *Fred Terman, The Father of Silicon Valley* (May 1985), *available at* http://www.internetvalley.com/archives/mirrors/terman.html.

46. *Id.*

47. *Id.*

48. *Id.*

49. Environmental Finance Center, Region IX, *Financing Environmental Technology*, A FUNDING DIRECTORY FOR THE ENVIRONMENTAL ENTREPRENEUR, Sept. 1998, at 65. [hereinafter *Financing Environmental Technology*].

50. *Id.*

51. *Id.*

industrial buildings had a tremendously favorable psychological effect on a community.[52] Revitalization of abandoned space became a goal of economic development agencies.

The mid 1970 marked a shift toward a service economy.[53] The "Rust Belt" states – Illinois, Michigan, Ohio, and Pennsylvania – that dominated during the industrial age, were now suffering economically.[54] During the Rust Belt recession, there was factory abandonment, unemployment, out migration, loss of electoral votes, and overall decline.[55] In response, the Rust Belt states opened business incubators to foster economic development through job growth.[56] In fact, the first modern form of business incubators in the U.S. was started in Pennsylvania and still operates today.[57] By the 1980s, the expansion or introduction of non-manufacturing industries had revitalized the economies in some Rust Belt cities.[58] For example, Pittsburgh has since emphasized its role as a center for finance, research, and development.[59] However, by 1980, there were fewer than ten incubators open in the U.S.[60] Thus, the use of incubators to foster economic development through job growth seemed to require something more.

III. THE BAYH-DOLE ACT

In 1980, Congress passed the Bayh-Dole Act to address concerns about declining U.S. productivity, rising competition from Japan,[61] and discomfort over the Government's inconsistent treatment of contracted inventions.[62] The Act's passage was the result of almost twenty years of lobbying by the non-profit sector to stimulate technology transfer through the patent system.[63] The Act combined many pieces of legislation introduced over many years that sought to establish a uniform patent policy within the Government.[64] The Government and the business world saw

52. *Id.*
53. THE COLUMBIA ENCYCLOPEDIA 2469 (6th ed. 2000).
54. *Id.*
55. *Id.*
56. *An Incubator Primer*, *available at* http://www.dotcomventuresatl.com/incubators.htm (last visited Jan. 16, 2003) [hereinafter *An Incubator Primer*].
57. *Id.*
58. THE COLUMBIA ENCYCLOPEDIA, *supra* note 53, at 2469.
59. *Id.*
60. *Id.*
61. Press & Washburn, *supra* note 13, at 39.
62. Lawrence Rudolph, *Overview of Federal Technology Transfer available at* http://www.fplc.edu/risk/vol5/spring/rudolph.htm (last visited Jan. 22, 2003).
63. *Id.*
64. 35 U.S.C. §§ 200-212 (2000).

universities as centers for learning, conducting basic and applied research, and creating commercially valuable ideas. To this end, the Act changed the presumption of title to any invention made by small businesses, universities and other non-profit entities through the use of government funds from the government to the contractor-grantee.

Conceivably, the Act represented the first cautious step into a new relationship between the Government, as represented by its agencies, and the universities. The Act permits universities to position themselves, by establishing or expanding technology transfer capabilities, to better ensure that innovation will follow invention. The world economy has changed to the point where companies and nations maintain a relative advantage only through their ability to rapidly commercialize new and innovative science and technologies.[65] This is evidenced by the increase in the number of academic institutions receiving patents during the 1980s from about 75 to 150 by 1989, and nearly 175 by 1997.[66]

In the 1980s, there was alarm about the declining trend of American economic and technological competitiveness.[67] To address these concerns, there was "a return to the land-grant philosophy with a renewed emphasis on the transfer to industry of knowledge, technology, know-how, and trained people in the interest of economic development."[68] Trends in academic patenting indicate the importance of academic research to economic activity. However, the real measure of technology transfer is the amount of patented technology that has been transferred to the private sector for further development into commercially viable products and processes that are useful to society.[69] In fact, patent licenses and options executed have increased steadily since the passage of the Bayh-Dole Act.[70] This phenomenon is known as "neotransferism."[71]

Arguments against the Bayh-Dole Act are that licensing transaction costs are large relative to the gains from exchanges between universities and industry; there are a number of low-value exchanges and agreements that have a low potential of truly

---

65. Joel Mokyr, *Punctuated Equilibria and Technological Progess*, 80 THE AMERICAN ECONOMIC REVIEW 350 (1990).

66. National Science Board, *Science and Engineering Indicators - 2000*, National Science Foundation NSB-00-1, *available at* http://www.nsf.gov/sbc/srs/seind00/ access/c6/c6s4.htm (2000) (last visited Jan. 17, 2003) [hereinafter *Science and Engineering Indicators – 2000*].

67. Lee, *supra* note 30, at 850.

68. *Id.*

69. Victor Rezendes, *Technology Transfer: Administration of the Bayh-Dole Act by Research Universities*, FY 98 General Accounting Office (GAO) Report RCED-98-126, Washington, DC. (May 7, 1998).

70. 35 U.S.C. §§ 200-212 (2000).

71. Lee, *supra* note 30, at 850.

yielding anything of commercial value; and there are also valuation problems associated with early stage inventions.[72] Other arguments include concerns about the potential distortions of the nature and direction of academic basic research, faculty members' potentially conflicting economic and professional incentives in such arrangements; and universities' potentially conflicting economic and professional incentives as they acquire equity interests in commercial enterprises.[73]

In addition, competition for funds has encouraged universities to accept sponsored research grants from industry that restrict access to results.[74] Although the research community did not have a prescriptive norm against seeking intellectual property,[75] another argument against the Bayh-Dole Act is that commercial enterprises do not share universities' commitment to the principal of sharing knowledge.[76] Contract clauses specifying delays or limitations in the publication of research results, and the possibility of the suppression of research results for commercial gain are a grave concern.[77] Contrary to universities, commercial enterprises consider the vigorous defense of their patents and trade secrets as an accepted business practice. The NIH recommends that universities allow corporate sponsors to prohibit publication for no more than one or two months.[78] This is the amount of time typically required to file a patent application. However, since the Bayh-Dole Act was enacted, lengthier delays are becoming standard.[79] For example, in exchange for twenty-five million dollars to fund basic research in the Department of Plant and Microbial Biology, "Berkeley granted Novartis first right to negotiate licenses on roughly a third of the department's discoveries" and allowed Novartis to postpone publication for up to

---

72. Rebecca S. Eisenberg, *The University Office of Technology Transfer: A Review of the Current U.S. System*, Working Paper No. 5, CASRIP Publication Series: Streamlining Int'l Intellectual Property at 62 (July 23-24, 1999). Presented at the 1999 High Technology Protection Summit Incentive for Basic Innovation: Inventions and Work Developed by Universities and Venture Companies: University of Washington, Seattle, WA.

73. *Science and Engineering Indicators – 2000*, *supra* note 66.

74. Goldfarb & Henrekson, *supra* note 2, at 8.

75. F. Scott Kieff, *Facilitating Scientific Research: Intellectual Property Rights and the Norms of Science – A Response to Rai and Eisenberg*, 95 NW. U. L. REV. 691, 694 (2001).

76. Arti K. Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 NW. U. L. REV. 77, 93 (1999). *See also* Rebecca S. Eisenberg, *Public Research and Private Development: Patents & Technology Transfer in Government-Sponsored Research*, 82 VA. L. REV. 1663 (1996) (referring to sharing technology in medical field).

77. *Science and Engineering Indicators – 2000*, *supra* note 66.

78. Press, *supra* note 13, at 41.

79. *Id.*

four months.[80]

The primary argument against the Bayh-Dole Act is that granting private companies licensing rights to publicly funded research has provided a "giveaway" to industry.[81] A solution to this problem is to encourage royalty-bearing licenses that reflect a fair financial return on the public's research investment. For example, the NIH maintains the public interest by encouraging this practice.[82]

The "increases in university patenting and licensing are frequently asserted to be direct consequences" of the Bayh-Dole Act.[83] Since biomedical patents issued to U.S. universities increased by 123 percent while non-biomedical patents only increased twenty-two percent from 1969 to 1979, some have suggested that the increase in university patenting and licensing may be due to the rise in biomedical research and the growth of its associated inventions, which predate Bayh-Dole.[84] Many U.S. research universities were active in patenting and licensing faculty inventions long before the passage of Bayh-Dole in 1980.[85] Thus, opponents have argued that Bayh-Dole has not delivered on its purpose to increase commercial activities.[86]

However, despite the arguments against the Bayh-Dole Act, universities' licensing activity has had a substantial economic impact. In 1996, the Association of University Technology Managers (AUTM) estimated that a survey of licensing activities of academic institutions, nonprofit organizations, and patent management firms add more than 24.8 billion dollars and 212,500 jobs to the U.S. national economy each year.[87]

Another study estimates that technology transfer programs put 434 million dollars into local economies.[88] "This economic stimulus is in the form of salaries, legal fees, inventor income, and

---

80. *Id.* at 40-41.

81. *Id.* at 41.

82. Wendy H. Schacht, *Federal R&D, Drug Discovery, and Pricing: Insights from the NIH-University-Industry Relationship*, CONGRESSIONAL RESOURCE SERVICE, 14 (June 19, 2000).

83. David C. Mowery, Richard R. Nelson, Bhaven N. Sampat, & Arvids A. Ziedonis, *The Growth of Patenting and Licensing by U.S. Universities: An Assessment of the Effects of the Bayh-Dole Act of 1980*, 30 RES. POL'Y 99-100 (2001).

84. *Id.* at 104. *See also Science and Engineering Indicators - 2000, supra* note 66, at 88 (describing how biomedical patents issued in the United States have dramatically increased).

85. Mowery, *supra* note 83, at 100.

86. *Id.*

87. Rezendes, *supra* note 69, at 17.

88. Dennis R. Trune & Lewis N. Goslin, *University Technology Transfer Programs: A Profit/Loss Analysis*, 57 TECHNOLOGICAL FORECASTING & SOCIAL CHANGE, 197, 202 (March 1998).

new research grants."[89] When the investment capital attracted by commercialization efforts is taken into consideration, "the local community experiences even greater financial benefits" to its economy.[90] Therefore, universities can have a great seedbed effect on their local economies. In fact, some universities are attempting to develop small high-tech businesses in incubator settings.

IV. USE OF INCUBATORS TO DEVELOP SMALL HIGH TECH BUSINESSES

There is a need for a new paradigm in favor of a more comprehensive approach to university technology transfer. There must be closer cooperation between colleges, universities, industry, and government economic development planners. As with Vannevar Bush's unique experiment of teamwork and cooperation in applying scientific principles to wartime challenges, a new experiment of teamwork and cooperation[91] can help increase university licensing transactions to start-up companies. The development of small businesses and entrepreneurial projects is an important component of economic growth. Incubators can provide the forum for these collaborations.

Incubators are focused on helping young businesses in a comprehensive fashion with new technologies through each phase necessary to get their products to market. Many technology incubators position themselves directly in the development path between the laboratory or university and the market.[92] Incubators are used for job creation, wealth creation, industrial regeneration, technology transfer, and more recently, military base redevelopment and reuse. Incubators also provide donations to start up businesses; training in the commercialization process to introduce new technology to market; inexpensive office and manufacturing space; equipment and administration support; and financial, technical, and managerial business guidance, which support new and start-up businesses.

University Incubators

In the 1980s, after Congress passed the Bayh-Dole Act, the small business incubator model began to be used for university and federal lab technology commercialization.[93] "These incubators were set up to commercialize technology developed in Government

89. *Id.*
90. *Id.* at 203-04.
91. *C.f.* Weidenbaum, *supra* note 36, at 66-67 (explaining how the current cooperation of government research is too prohibitive, and a new experiment in teamwork is needed).
92. *Financing Environmental Technology*, *supra* note 49, at 75.
93. *An Incubator Primer*, *supra* note 56.

sponsored university labs."[94] The NSF began examining small business incubators as a way to foster entrepreneurship and technology transfer at research universities.[95] In addition, individual entrepreneurs and investors were investigating the incubator concept as a way to share their experience with new and innovative companies. "As a result, there was tremendous growth of new incubators during the 1970s and 1980s, so that by the late 1980s, small business incubation was considered a new industry."[96]

Incubators were designed to commercialize technology for the benefit of business owners, produce income for researchers through licensing and create jobs.[97] The recession of the late 1980s and early 1990s saw a decrease in the number of incubators in the U.S. as state and federal government cutbacks meant many of the programs could not be funded out of state coffers. Despite this initial decline, the deep recession of the early 90s has actually spurred a boom in the incubator industry.[98] "As states and [local governments] sought ways to spur economic growth, incubator programs began to [emerge] faster than ever."[99]

The number of incubators in the U.S. had grown to an estimated 400 to 500 by the end of the 1980s.[100] As of 1998, there were more than 800 incubators in the U.S.[101] Specialized incubators devoted to one industry such as biotechnology, communications software, or environmental technology, tend to locate in highly urbanized areas that can support a large population of entrepreneurs in one particular niche.[102] Research universities are invaluable since they have strong technical programs, cultures of cooperation, and the ability to leverage a network of resources.

According to the National Business Incubation Association (NBIA), "the federal government, along with other state, local and private entities have become the prime financial supporters of incubators throughout the U.S."[103] "Generally, incubators receive financial backing from a number of resources. Overall, however, in the 1990s the largest contributors were local and state

94. *See id.* (explaining how certain incubators can accomplish both academic and economic goals).

95. *Id.*

96. *Financing Environmental Technology*, *supra* note 49, at 65.

97. *An Incubator Primer*, *supra* note 56.

98. *Id.*

99. *Id.*

100. *Id.*

101. National Business Incubator Association, *Business Incubation Facts* (2000), *available at* http://www.nbia.org/resource_center/bus_inc_facts/index.php (last visited Jan. 21, 2003) [hereinafter *Business Incubation Facts*].

102. *Financing Environmental Technology*, *supra* note 49, at 82.

103. *Id.* at 65.

governments, foundations, academic institutions, corporations, financial institutions and the EDA."[104] Conversely, while incubators are funded by numerous public and private entities, the majority are owned and operated by economic development agencies.

University licensing offices view start-up companies as an effective vehicle for commercializing early stage inventions. These companies license inventions from a university, develop the technology to a certain stage, and then partner with larger companies that can bring experience, resources, and marketing know-how to the smaller company. Universities are often willing to take equity as partial compensation for a license agreement since start-up companies are typically cash poor.[105]

Technological developments also benefit firms that are located within the general vicinity of a university.[106] Capitalizing on this, university incubators provide support for nurturing new technology firms.[107] "In the United States, incubators established to increase the growth rate of new and small businesses are seen as a tool for local growth and development."[108] Therefore, it is crucial for universities to work closely with local government economic development agencies and industry partners.

Universities sponsor most of the technology incubators.[109] Ideally, technology incubation focuses on the commercialization of new and innovative technologies from a variety of industries. The majority of incubator clients tend to be involved in light manufacturing, service based, technology based, or research based businesses.[110] Many specialized incubators form as a result of a developing industry cluster strategy spurred by local government economic development programs.[111]

"For example, the Austin Technology Incubator, associated with the University of Texas, Austin, has nurtured more than thirty-eight companies, created more than 500 jobs, and has

---

104. *Id.* at 65-66

105. Robert Buderi, *Engines of Tomorrow: From the Ivory Tower to the Bottom Line*, TECHNOLOGY REVIEW (July/Aug. 2000), *available at* http://www.enginesoftomorrow.com/ivory.htm (last visited Jan. 20, 2003).

106. *Financing Environmental Technology*, *supra* note 49, at 76.

107. Alameda Center for Environmental Technologies, *University Related Incubators* at 4, (Aug. 1997), *available at* http://www.greenstart.org/efc9/publications/pdf/incubators/ URI.pdf (last visited Apr. 14, 2003).

108. *Id.* at 3.

109. Alastair Goldfisher, *Incubators Hatch Business 'Chicks'* (Aug. 5, 1996), *available at* http://sanjose.bizjournals.com/sanjose/stories/1996/08/05/smallb2.html?t=printable (last visited Jan. 18, 2003).

110. *Business Incubation Facts*, *supra* note 101.

111. *Id.*

brought approximately sixty million dollars to its local community in the first four years of operation."[112] In San Jose, the Software Business Cluster (an incubator associated with San Jose State) firms have received over twenty million dollars in venture capital, while companies at the NASA Ames Technology Commercialization Center incubator associated with the NASA Ames Research Center (also in northern California) have received about fifty million dollars.[113]

Incubation and Job Creation

Nationwide, U.S. incubators have created more than 19,000 companies that are still in business and employ more than 245,000 people.[114] In 1996, the average incubator had created 468 direct jobs and another 234 spin-off jobs for a total of 702 new jobs in their communities. Firms from high-tech incubators created more jobs than other types.[115] Indeed, the "NBIA estimates that North American incubator clients and graduates have created approximately half a million jobs since 1980." [116]

In 2000, according to the Association of University Technology Managers (AUTM), 454 start-up companies were formed on the basis of a license to an academic invention at U.S. universities.[117] In 1996, overall, university technology transfer activities generated 24.8 billion dollars and supported 212,500 jobs.[118] By 1998, these numbers grew to 33.5 billion dollars and 280,000 jobs respectively.[119] Since 1987, MIT has spawned 4,000 companies and employed 1.1 million people with revenues of 232 billion dollars.[120]

---

112. Alameda Center for Environmental Technologies, *University Related Incubators* at 4, (Aug. 1997), *available at* http://www.greenstart.org/rfc9/publications/ pdf/incubators/ uri.pdf (last visited Jan. 21, 2003).

113. Goldfisher, *supra* note 109.

114. *Executive Summary of NBIA's 1998 State of the Business Incubation Industry Findings* (1998), *available at* http://www.nbia.org/resource_center/ bus_inc_facts/ state_of_industry_1998.php (last visited Jan. 28, 2003).

115. *An Incubator Primer*, *supra* note 56.

116. *Business Incubation Facts*, *supra* note 101.

117. *AUTM Licensing Survey: FY 2000 Survey Summary* (2002), 14. Northbrook, IL: Association of University Technology Managers, Inc. (AUTM).

118. Association of University Technology Managers, *FY 98 Licensing Licensing Survey Executive Summary* (1999) *available at* http://www.autm.net/pubs/survey/1998/ execsumm.html (last visited Jan. 18, 2003).

119. *Id.*

120. WAYNE AYERS, MIT: THE IMPACT OF INNOVATION 2 (1997).

Success of Incubated Companies

"Between 3.5 and 4 million new small business[es] emerge each year in the [U.S.], and in over thirty-five percent of American households someone has started, helped finance or attempted to start a small business."[121] And of these new businesses, four out of five fail within the first five years, according to the U.S. Small Business Administration.[122] However, the National Business Incubator Association (NBIA) estimates that eighty-seven percent of firms cultivated in an incubator continue to operate after the same time period has elapsed.[123] Evaluators of the impact of business incubators have found higher success rates for incubated firms than for other new businesses. Companies typically stay in incubators for an average of twenty-eight months and perhaps as long as five years,[124] and the NBIA has found that "[e]ighty-seven percent of all firms that graduated from their incubators are still in business."[125]

With respect to economic development, job creation per incubator firm tends to be relatively small, having fewer than ten employees, which may increase over time.[126] Although the nationwide number of jobs created looks impressive, the emphasis that many incubators place on job creation is sorely misplaced since the vast majority of small new firms are not high job generators in the short term.[127] In addition, the EDA has found that incubators will never be able to replace the number of jobs lost within a community due to downsizing and the disappearing manufacturing base. And more importantly, incubators rarely help blue-collar workers since they are rarely entrepreneurial. Therefore, incubators cannot be seen as a short-term, quick fix to local economic problems.[128] The benefits are only visible in the long-term.

University's Role in Economic Development

Because of the long-term realization of benefits, it is not expected that incubated firms will lead to quick fruits as an economic policy.[129] Universities should not limit their efforts only

---

121. *Financing Environmental Technology*, *supra* note 49, at 67.
122. Goldfisher, *supra* note 109.
123. *Business Incubation Facts*, *supra* note 101.
124. *Financing Environmental Technology*, *supra* note 49, at 68.
125. *Business Incubation Facts*, *supra* note 101.
126. Brian Harmon, et al., *Mapping the University Technology Transfer Process* (1997) *available at* http://www.babson.edu/entrep/fer/papers95/harmon.htm (last visited Jan. 28, 2003).
127. *Id.*
128. *Financing Environmental Technology*, *supra* note 49, at 69-70.
129. Collier, *supra* note 6, at 187.

to technology commercialization, but instead should communicate with all forms of industry that is critical for long-term regional development.[130] The transfer of university expertise to firms is important to industry.[131] In fact, some have defined technology transfer in terms of networking arrangements designed to emphasize the role of long-term relationships between universities and industry.[132]

To reinforce this notion, it has been suggested that it is not "transferring" but "learning" that is at issue.[133] Arguably, true technological advance depends on what the individual customers who live and work in a particular society have learned and applied in order to produce more with the same resources.[134]

Essentially, there are two types of technology developers. The first kind of developer focuses on marketing unique quality products. The second kind of developer emphasizes creating customer-developed solutions to meet the specific needs of a single customer.[135] The customer-focused developers spend more than ten percent of their sales revenues on research and development compared to only five by the technological leaders.[136] Fifty-four percent of the technological leaders maintain contacts of some type with universities or research institutes, and fifty-nine percent of the customer-focused developers maintain contacts with university researchers.[137] Therefore, "most successful [technology] transfers are based on strong prior connections and relationships between those in the lab and those in the business community."[138]

Today, universities are doing much more than mere technology transfer (technology marketing and patent licensing). There is pressure to forge stronger relations with local government economic development agencies and the business community. This is a difficult task for technology managers. Therefore, there needs to be a more comprehensive, strategic approach to relationship building in order for technology transfer to become a successful economic development initiative as encouraged by Bayh-Dole.

---

130. *Id.*

131. *Id.* at 187-88.

132. Harmon, *supra* note 126.

133. ROBERT SOLO, ORGANIZING SCIENCE FOR TECHNOLOGY TRANSFER IN ECONOMIC DEVELOPMENT 11 (Michigan State Univ. Press 1975).

134. *Id.*

135. Hans Georg Gemunden and Peter Heydebreck, *The Influence of Business Strategies on Technological Network Activities*, 24 RES. POL'Y 831, 836 (1995).

136. *Id.*

137. *Id.* at 842.

138. Harmon, *supra* note 126, at 433.

V. STRATEGIC ECONOMIC DEVELOPMENT PLANNING

With respect to economic development, the key to wealth and job creation in the "New Economy" is largely dependent on the extent to which ideas, innovation, and technology are embedded into services and manufactured products.[139] Thus, rapid technology developments and widespread creation of new technologies by research institutions are setting the pace of the "New Economy." Dramatic improvements in technology have given rise to a global framework for defining work, society, culture, politics, investment, commerce, health and education.

The increased "global" framework is experienced most profoundly through transformed "local" relationships and practices. Therefore, arguably, the best way to take advantage the "New Economy" and its potential to positively impact the quality of living at the local government level is to encourage greater communication and cooperation between community colleges,[140] universities, medical schools, hospitals with research centers, economic development agencies, venture capitalists, and industry leaders.

In reality, increasing university collaboration with industry and local government economic development agencies may continue to spawn concerns about a potentially distorted nature and direction of basic academic, ivory tower research. Concerns that granting private companies rights to publicly funded research is a "giveaway" may continue. The argument that universities will neglect teaching and humanities in favor of commercially oriented research may continue. However, faculty surveyed from a range of research universities agree that universities should take an active role in such activities as planning regional economic development, commercializing academic research, providing start-up assistance to new technology firms, and providing equity investment in firms based on university research.[141] Although some may continue to question commercial gain and faculty conflicts, local government economic development agencies should capitalize on the growing eagerness of universities to exploit the economic potential of their research activities and the readiness of entrepreneurs and corporations to invest in the research's market potential.

The best way to address these concerns is to encourage greater communication and cooperation between the various entities involved in planning regional economic development.

---

139. STATE SCIENCE & TECHNOLOGY INSTITUTE, *supra* note 4, at 25.

140. Diane S. Long, *The Role of the Community College in Economic Development: Technology Transfer - A Pilot Program*, 3:1 VCCA J. 28 (Spring/Summer 1988).

141. Lee, *supra* note 30, at 852.

These people include local public development agencies, chambers of commerce, non-profit community development agencies, consultants, state development agencies, and the federal government. Unfortunately, however, university technology managers are not trained to facilitate such communication. Indeed, tech managers typically have engineering, science, law, and business experience, and are unable to form collaborations that foster local economic development. Therefore, technology transfer specialists need the proper training in order to facilitate communication and build coalitions between the relevant local economic planning entities in the public and private sector.[142]

This strategic planning process should be used to enlarge the base of support for technology transfer and incubated, small business initiatives. Essentially, there are eight steps in strategically developing the technology transfer office's role in economic development: 1) decide what it wants to gain from economic development activities and build consensus among institutional constituents regarding goals; 2) become close to customer-focused developers and assess community and industry economic needs; 3) decide how to marshal the strengths of the university's intellectual property portfolio to meet those needs; 4) determine targets of opportunity such as fostering small, incubated businesses in economic development niches; 5) make necessary investments in the effort; 6) organize new activities into existing or new structures; 7) establish new policies as necessary; and 8) implement and follow through.[143] A university technology management office would bode well to have a long-term economic development strategy with flexible shorter-term implementation action plans. The implementation plans should assign responsibilities, timelines, and budgets.

This strategic approach makes the most efficient use of resources. For example, most university technology transfer offices do not work closely with local community colleges and take advantage of their services. This author knows of no university technology transfer office that does so. However, community colleges can assist with identifying real problems that entrepreneurs and investors encounter and developing solutions to the problem. Many community colleges have established small business incubators and can provide several services to developing businesses. Many teach and assist entrepreneurs (especially targeted business owners such as females, minorities, disabled,

142. STATE SCIENCE & TECHNOLOGY INSTITUTE, *supra* note 4, at 3.

143. David R. Powers, *Creating Successful Partnerships*, *in* HIGHER EDUCATION IN PARTNERSHIP WITH INDUSTRY: OPPORTUNITIES AND STRATEGIES FOR TRAINING, RESEARCH AND ECONOMIC DEVELOPMENT 119-20 (1988).

dislocated, and youth programs). Like community colleges, university technology transfer managers often ignore hospitals. However, universities with medical schools and hospitals with research centers are the most successful at putting money into their local economies.[144] Thus, state universities that do not have medical schools should collaborate with local private medical schools, hospitals, and health-oriented research centers.

Besides community colleges, federal government agencies, state authorities, local government economic development planners, hospitals, private research centers, and managers of venture funds should be engaged in the technology transfer process. These groups can provide businesses with unfamiliar or underutilized technological, financial, legal, and administrative resources. In a coordinated, strategic fashion, all of these players can work one-on-one with incubated small businesses to foster growth and university technology transfer.

VI. PROPOSED AMENDMENT TO BAYH-DOLE

Because universities are increasingly pressuring their technology transfer specialists to become stewards of their region's economic development, Congress should amend the Bayh-Dole Act to promote collaborations between university tech transfer offices, local community colleges, local economic development planning agencies, federal labs, select managers of venture funds, and industry leaders. Cooperative Economic Development Agreements (CEDAs) can accomplish this goal. Using CEDAs would better reflect the policy and objective of Congress, which is in part to "promote collaboration between commercial concerns and nonprofit organizations, including universities."[145] Congress should pattern the legislative provisions for CEDAs after those for the Cooperative Research and Development Agreements (CRADAs) used by government operated or owned federal labs found in Title 15 of the U.S. Code.[146]

"Two months before the Bayh-Dole Act was passed, Congress enacted the Stevenson-Wydler Technology Transfer Act of 1980 (Stevenson-Wydler)."[147] Stevenson-Wydler established that federal agencies should ensure that results of research and development funded by the government are transferred into both state and local governments and to the private sector.[148] Just as universities have established offices of technology transfer in compliance with Bayh-

144. Trune, *supra* note 88, at 202.
145. 35 U.S.C. § 200 (2000).
146. 15 U.S.C. § 3710a (2000).
147. Rudolph, *supra* note 62.
148. *Id.*

Dole, Stevenson-Wydler required agencies to establish Offices of Research and Technology Applications (ORTAs) at their federal laboratories.

In 1986, the Federal Technology Transfer Act (FTTA) amended Stevenson-Wydler, by authorizing CRADAs between government owned and government operated (GOGO) laboratories and nonfederal entities.[149] In 1989, The National Competitiveness Technology Transfer Act amended the section governing CRADAs to authorize government-owned and contractor operated (GOCO) laboratories to enter into CRADAs on the same basis as its GOGOs.[150] "As Federal labs gained experience, these agreements have proven to be a successful way to partner with the private sector. They allow for access to unique Federal lab equipment, the transfer of scientific information and expertise as well as for the development of intellectual property."[151]

Title 15 authorizes Federal agencies to enter into licenses and assignments with their CRADA partners and to provide, accept, retain, and use funds, personnel, services, and property from a collaborating party.[152] It also provides guidance on how a Federal Agency can disapprove of or modify agreements; and for confidentiality, the review of standards of conduct, and conflicts of interest.[153] "[A] majority of chief technical officers believe the most important payoffs from interaction with federal labs will come in the form of access to knowledge and expertise, leveraging [research and development], sharing risks, and complementing [research and development] portfolios."[154] For CEDAs, success will come in the form of access to knowledge and expertise in strategic planning, leveraging commercialization, sharing resources, and complementing intellectual properties that are available for licensing and sale.

The CRADA model is ideal for bringing together industry and universities as they attempt to work closely on economic development initiatives related to university technology transfer covered by the Bayh-Dole Act. The current CRADA provisions in Title 15 would suffice so long as references to research and development are changed to reflect that CEDAs facilitate commercialization efforts. Also, the CRADA provisions would be changed to ensure that universities have an annual strategic plan

---

149. *Id.*

150. *Id.*

151. *Hearing Report: A Review of the Department of Commerce's Biennial Report on Federal Technology Transfer: Hearing before House Science Subcommittee on Technology* (May 23, 2000) (statement of Relda Nacos).

152. 15 U.S.C. §§ 3710a(b)(1), (b)(3)(A) (2000).

153. 15 U.S.C. §§ 3710a(c)(3), (c)(5), (c)(7) (2000).

154. Carr, *supra* note 3, at 301.

for their economic development initiatives. As aforementioned, a sound strategic economic development plan would include eight key sections: 1) what the university wants to gain from collaborative economic development activities and consensus-building with a host of relevant players; 2) how the university intends to become close to customer-focused technology developers and assess its community and industry economic needs; 3) how the university intends to marshal the strengths of its intellectual property portfolio to meet the economic development need; 4) how the university will determine targets of opportunity such as fostering small, incubated businesses in economic development niches; 5) how the university and other relevant players "intend to make necessary investments in the effort;" 6) how the university intends to organize its new economic development activities into existing or new structures; 7) what new policies will be necessary; and 8) how the university intends to implement its economic development initiatives and follow through.[155] The most important section includes fostering small, incubated businesses in economic development niches.

VII. CONCLUSION

It has been more than twenty years since the Bayh-Dole Act became law. There is now a growing trend toward universities pressuring their technology transfer specialists to become stewards of their region's economic development. Offices of "technology transfer" are becoming offices of "technology transfer and economic development." Unfortunately, most technology transfer specialists are not experienced in strategic economic development planning, or in the formation of collaborations that foster local economic development; instead, they need guidance, and the Bayh-Dole Act should be amended to provide such guidance.

Since universities can have a seedbed effect on their local economies by using a more comprehensive approach to technology transfer via the development of small high-tech businesses in incubator settings, the Bayh-Dole Act should be amended to promote strategically planned collaborations between university tech transfer offices, local community colleges, local economic development planning agencies, federal labs, select managers of venture funds, and industry leaders.

More specifically, the Bayh-Dole Act should be amended to encourage the use of a new type of collaborative arrangement called Cooperative Economic Development Agreements (CEDAs). The use of CEDAs would better reflect the policy and objective of

155. Powers, *supra* note 143, at 119-20.

Congress, which is in part to "promote collaboration between commercial concerns and nonprofit organizations, including universities. . . ."[156]

Revisions to Bayh-Dole should provide guidance for the use of CEDAs just as Title 15 provides for the Cooperative Research and Development Agreements (CRADAs) entered into by Federal labs with other Federal agencies, state or local government units, industrial organizations, public and private foundations, non-profit organizations, or other persons (such as licensees of inventions). If these CRADA provisions were used to guide university technology transfer specialists in their use of the newly proposed CEDAs, emphasis on research and development could be replaced with an emphasis on commercialization through the incubation of start-up companies.

There should also be an added requirement that the universities must develop annual comprehensive strategic plans for their economic development initiatives. Economic development collaborations with university tech transfer offices should involve a large group of participants (i.e. local community colleges, local economic development planning agencies, federal labs, select managers of venture funds, and industry leaders).

Research universities working in conjunction with small business incubators offer local economies unlimited opportunity. The combined efforts of universities working together with local economic planners to transfer discoveries into the private sector for commercial use will inject new products into local economies, creating new businesses and jobs. This is particularly true in the tech industry, evidenced by the explosion of economic activity in the Silicon Valley during the 1990s. Congress should amend the Bayh-Dole Act as recommended in this Article in order to take full advantage of the unlimited opportunity that universities offer to their local communities.

156. 35 U.S.C. § 200 (2000).